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Report

LABOUR SUPPLY AND WAGE DETERMINATION
IN RURAL UTTAR PRADESH

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I. Problems in Rural Labour Market Analysis

Empirical studies on rural labour markets in India have thrown up enough evidence to indicate that the supply, demand and wage rate of labour in agriculture are difficult to explain as simple functions of each other. While some studies do find that labour market is fairly competitive and wages respond to ordinary laws of demand and supply,[1] a number of others have emphasised the structural rigidities of the labour market that make demand and supply of labour rather inelastic to wage rates,[2] and wage rates somewhat unresponsive to the variations in the demand and supply of labour. No doubt, labour markets tend to have a slower adjustment mechanism than other markets everywhere and demand, supply and wages respond to each other only with substantial lags. The imperfections and rigidities are, however, found to a much greater degree in the rural labour markets so much so that these markets sometimes look qualitatively different from other markets. Certain institutional arrangements render labour supply <u>inflexible</u> even with significant changes in wage rates, and wages invariant despite rise in demand.

It is well recognised that the most important factor making for a qualitatively different pattern of functioning of the rural labour markets is the household based organisation of agricultural production. Supply of family labour, which accounts for the major part of labour employed in agriculture, is not subject to changes in wage rates as such, but is determined by size of active age group population and social attitudes to work. The latter is particularly significant in case of supply of female labour, which is the major factor accounting for difference in worker-population ratio among regions and periods. Another

social institution introducing rigidity in the functioning
of the labour market is the widely prevalent practice of
attached labour, under which workers attached to a parti-
cular employer are not able to effect inter-employer mobility
nor are their wage rates easily flexible.   Large extent and
peculiar nature of unemployment among agricultural workers
makes its own contribution in diffusing the demand, supply
and wage inter-relationships in the rural labour markets.
Existence of sizeable surplus labour which is not actually
redundant as most of it is required in certain periods in
the year,3/ adds to labour stock, which can be converted
into labour supply at any wage rate during the lean seasons
of the year.   This stock and potential supply may vary
among areas but such variations may hardly get reflected
in differences in wage rates.   Moreover, while all labour
markets are found to have regional and local character as
they deal in human beings, the rural labour markets tend to
assume this characteristics more significantly.4/   The
institutions of family and community, have stronger force in
tying a worker to his home in rural areas. Consequently,
labour supply also becomes more localised and competitive
forces leading to equalising tendency in wages through inter
area movements of labour supply are rather weak.   In view
of this characteristics of rural labour, analysis of rural
labour markets is meaningful at a regional or local, rather
than national level.

     Demand for labour also poses both theoretical and
empirical types of problems in the analysis of rural labour
markets.   First, employment of workers in agricultural
operations, most of which work on family farms, gets extended
to the extent of supply, rather than being fixed at the
point of equality between wage rates and the marginal product.
Number of workers engaged in agriculture is, therefore, not
a reliable indicator of the demand for labour and most of
it may be invariant in relation to wage rates.   Even the
demand for hired labour, which is expected to be influenced
by wage rates, may actually be invariant and may not vary
inversely with wage rates, particularly in peak seasons
when certain agricultural operations have to be completed
in a given period of time.   High wage rates, or more often,
inelasticity of labour supply, may, however lead to substi-
tution of labour by machines for these operations.

     Besides these analytical problems, the nature of
demand poses very severe empirical problems of specification
in analysing rural labour market behaviour.   As pointed out,

number of workers reported engaged in agriculture do not constitute ex post demand for labour in agriculture; they may all be required in agriculture but all their labour is not adequately utilised there. In fact, the intensity of their employment in agriculture is found to be less than one half of the potential labour time at their disposal in the case of Uttar Pradesh.5/ Variations in number of workers engaged in agriculture, thus mainly reflect the differences in the supply of such workers in rural areas rather than in the effective demand for their labour in agriculture. To the extent employment opportunities are available in the non-agricultural occupations in the rural areas, employment figures may indicate demand for labour with a greater degree of reliability and the labour market behaviour would show a greater responsiveness of supply, demand and wages to each other. The non-agricultural employment, however, exists only to a small degree in most of the rural areas.

The characteristics of supply and demand of labour in rural areas obviously render the application of a simple demand-supply framework somewhat limited and complex. Even though the question of wages is relevant only for the hired non-family labour, the combined use of hired and family labour limits the scope of analysing wage determination in the neo-classical marginal productivity framework. Institutional arrangements such as long term contract in the form of attached labour make the wage rates further unresponsive to market conditions. And the universal existence of excess supply of labour, do not allow wage rates to vary with marginal changes in demand and supply of labour.

The above observations, however, do not imply that the labour market behaviour in rural areas is completely devoid of economic logic. In ultimate analysis labour may not be supplied if it does not fetch a reasonable wage rate, actual or imputed; size of its demand would be determined by a comparison of what it costs and what it yields; and, high or low wages would be paid depending on what the market warrants. Yet the institutional context does make these relationships rather blurred; and therefore, the analysis has to be conducted taking account of the factors that are likely to hinder or help the play of demand and supply rather than in terms of demand and supply as such, which in any case pose serious problems of specification.

Scope of Present Study

The present study attempts an analysis of labour market behaviour in rural Uttar Pradesh, with the implicit recognition of the constraints and propositions stated above. The study is conducted on the cross-section inter-district basis using data for 1971. The choice of mode and period of analysis is dictated by data availability. It is recognised that the findings of the cross-section analysis have limitations for application temporally; but data are not available for most of the relevant variables on a time series basis.

A complete analysis of labour market behaviour requires explanation of determinants of demand, supply and wages of workers. As pointed out earlier, there are, however, serious problems of specifying these central variables, as well as those relevant as independent explanatory variables. The problem is relatively more acute in the case of demand. Workers engaged in agriculture are not a reliable proxy for demand for labour, as a sizeable part of their labour is not actually required there : it therefore remains unutilised and/or generates a marginal product lower than the going market wage rate. An alternative is to estimate the demand on the basis of actual requirements of labour in agricultural activities. This can be done by deriving norms (either on an average or experimental basis) of labour requirements per unit of cultivated land for each crop and apply them on the given size, intensity and cropping pattern of cultivated land in each of the geographical unit under study.6/ Such an approach has been adopted in this study to estimate demand for labour for each district for deriving a measure of surplus labour for use as an explanatory variable in the analysis of wage rate variations. But we have refrained from attempting an explanation of variations in demand so estimated. For, the variables which could be important for explaining demand or factors affecting it are already used for estimating demand for labour, it would be axiomatic and somewhat absurd, to use them again to explain demand.

Our analysis in this paper has, therefore, been confined to develop and verify hypotheses relating to the inter-district variations in the supply of labour and wage rates in agriculture. Supply of labour in a district is

obviously dependent on the size and structure of population, which would vary among districts in the first instance due to differences in area and habitation pattern. Absolute size of labour force would, therefore, not serve as an appropriate indicator of variations in labour supply; ratio of workers to population or to cultivated land area is a better indicator for our purpose. Worker-land ratio is, however, an amalgam of supply and demand forces, as it reflected both the pressure of population on land and employment in agriculture. We have, therefore, opted for labour force participation rate as the indicator of relative labour supply in various districts.

Worker-population ratio or labour force participation rate, on the other hand, is found to vary among areas mainly on account of variations in the participation rates among women workers. The phenomenon is so universally recognised that the constancy of male participation rates among geographical areas and periods has been acclaimed as one of the "Great Ratios in Economics".7/ Among districts of Uttar Pradesh, the male labour force participation rate in rural areas, varies between 49 and 56 per cent, except some extreme cases such as Jaunpur (46.40), Ballia (46.60), Azamgarh (47.70), Ghazipur (48.10), Varanasi (48.50) and Bulandshahr (48.30) at the lower end, and Bahraich (62.20), Gonda (60.10), Kheri (60.00), Saharanpur (59.30), Barabanki (59.00) and Basti (57.8), at the upper end. Female participation rates, on the other hand, are found to vary between 0.75 per cent in Mainpuri to 16.63 per cent in Mirzapur.8/ The analysis of labour supply, therefore, concentrates on the explanation of inter-district variations in female labour force participation rates (briefly FPR). Analysis of wage rate variations among districts has been attempted both for male and female wage rates separately with suitable changes in the explanatory variables postulated to affect demand or supply.

I. Labour Supply : Determinants of FPR

i)   Hypotheses

It is well known that traditionally women have played only a secondary role so far as working out of homes is concerned : the first opportunity to participate in economic activity gets allotted to men. The situation could be diff-

erent in areas where activity pattern has a significant
element of work which women could perform more easily and
effeciently or where the supply of male labour has reached
virtual saturation. A lower participation rate among women
than among men is the natural result of this phenomenon.
In rural U.P. the female labour force participation rate
stands at 7.27 while the male rate is found to be 52.98
per cent. But variations in female participation rates are
very wide. In the above back-ground, it is reasonable to
postulate the availability of male labour per unit of land
and percentage of area under such crops as use more female
labour (e.g. paddy), as the two central variables determining
female participation rate.

The relevance of wages and income, however, cannot be
ruled out. In fact, importance of income and wage levels
implicit to some extent in the 'secondary role', proposition
stated above, to the extent need or willingness to work out
of homes would be determined by the incomes of family and
wages of male earners, and female wage rates respectively.
Wage rates would thus influence female labour supply both
through income and substitution effects. It has been
observed in the developed countries that the female parti-
cipation in work force has been a positive function of their
own wage rate and negative function of the family incomes.9/
Further, in the areas producing mainly for subsistence, the
principle of 'limited wants' may apply because of which there
is not much pressure to increase production, and utilise
more of available labour once a minimum level of income is
reached, as there is little sense of dis-satisfaction at
lower levels of material well being.10/ In an underdeveloped
region like U.P. characterised by wide spread powerty, lower
wages may encourage greater participation in economic acti-
vity because of the necessity to achieve a desired or sub-
sistence level of income. A generally low level of wages
would require greater participation by family workers to
attain the targetted income. This appears to be the case
to a large exent in rural U.P. Wages have remained low as
an unfavourable ratio of output to input prices have pre-
vented an increase in income levels of households employing
hired workers, forcing them to increasingly substitute
family labour for hired labour. With the rising prices,
the cost of living for agricultural labourers has increased,
and in order to maintain the subsistence level of living a
larger number of females of these families have to enter
labour force to supplement family income.

The negative relationship between female wage rates and participation, in view of low family incomes, would imply that with the increase in incomes beyond a level, the female participation would decline, as women would no longer be required to work to contribute to the subsistence level of income. Thus, the supply curve of female labour would have a backward bending shape, implying a negative relationship between female participation and income levels. The more general form of this relationship has been observed as 'U' shaped curve. It suggests that the participation rate decreases in the early phase of development and then increases in the later stage of development. According to this hypothesis in early stages of development women are pushed out of jobs by competition with men. With rising income the pressure on women to earn supplementary income is also reduced.11/ Starting from very low-below subsistence-levels of incomes, however, it may be argued that the female participate rates curve would tend to assume an inverted U-shaped form. Low wages and incomes would force more of them to enter labour market, which would increase the household incomes, and after reaching a reasonable level of income to maintain customary standards, they might withdraw from labour force. Withdrawal might get expedited with faster increase in wage rates of male workers and general productivity levels. It is doubtful if most parts of U.P. have yet reached the level of economic development, where the negative slope of the hypothesised curve is relevant, although some observers tend to think that declining part of the U-shaped curve is already in operation.12/

Income levels, thus, form an important factor explaining the variations is female participation rates. The framework of relationship is broadly what is implied in the "additional worker" hypotheses : the low household income levels compel women to participate to supplement income earned by men; and also, lower the wage rates more of them have to work to make the necessary contribution. The tendency of a simultaneous increase in income levels and participation rates may operate over the range where demand for additional income is absolutely inelastic and in the condition where incomes cannot be raised by increase in per worker productivity and earnings. Having reached a level of income where demand for additional income becomes somewhat elastic to disutility of loss of leisure or loss of social prestige, increase in income levels would lead to a fall in female participation rates.

The above arguments also lead us to postulate a positive relationship of share of landless labourers in rural population and of small farmers in the total culti- vated area with female participation rate. It is presumed that the families in these groups will have a greater inelasticity of demand for additional income; and, the loss of social status in participation of women in economic activity would be low, because of the relatively weak force of inhibitions to work out of homes, at least in the case of landless labourers.

ii) Variables

We have identified variables for our analysis in accordance with the above discussion, and specified them in the following manner :

Supply of female labour has been measured in terms of female labour force participation rate (FPR), which has been computed as percentage of working and unemployed women to the total female population. The figures of unem- ployed have been derived from the 1971 Census category of 'other' non-workers. The FPR is sought to be explained in terms of the following variables.

1.   Availability of male labour : In accordance with the 'additional worker' hypotheses of female labour supply, we have taken number of male workers per 100 hectares of culti- vated land, as a vairable expected to explain female labour supply inversely.

2.   Cropping Pattern : With a view to accounting for the influence of predominance or otherwise of the crops with significant share of women-specific processes, percentage share of paddy in gross cropped area has been chosen. It is well-known that paddy cultivation, particularly its transplanting and weeding operations, is carried out predominantly by women workers.

3.   Wage Rates : In spite of conflicting hypotheses and evidence, wage is still a relevant variable for explaining labour supply. It is an empirical question whether it affects female labour supply independently or through household income; or, directly or inversely. A labour supply model would, therefore, be incomplete without wage rate as an explanatory variable. We, however, have data

on female wage rates available only for 10 out of 48 districts included in our analysis, collected by Government of India and published in Agricultural Wages in India.13/ The ten districts (Allahabad, Faizabad, Gorakhpur, Varanasi, Lucknow, Jhansi, Agra, Bareilly, Meerut and Nainital) are well spread over the entire State. We have estimated the female wage rates for other districts by applying the ratio of female to male wage rates of each of the 10 districts to the male wage rates (which are available for all districts from the records of the Directorate of Economics and Statistics, U.P.) of the neighbouring districts. The wage rates thus computed have obvious limitations in so far as the male-female wage ratios have been held constant over an average of 5 districts each. But this procedure became inevitable in view of lack of data on female wages for each district in the State.

4.   Income Levels : Importance of income levels has been recognised widely in producing variations in female labour force participation rates. Here again, non-availability of per household or per capita income for rural sector for districts has led us to use a proxy. We have used figures of value of output per agricultural worker to indicate relative levels of income in various districts.14/ In general it is expected to have a negative relationship with FPR, but the relationship may get distorted at extremely low levels of productivity and incomes.

5.   Small Holdings : Relatively small sized holdings are found to use more labour per unit of land, and since they use more or less solely the family labour, a higher proportion of such holdings is likely to lead to a higher FPR. Further, the argument of inelasticity of demand for income may rein-force this tendency on the part of small holders. We have, therefore, chosen percentage of area under holdings below 3 hectares as one of the variables for explaining inter-district differences in FPR.

6.   Agricultural Labour Population : The rural workers whose livelihood is primarily derived from wage labour are among the poorest, and their females do not show the same inhibitions to go out for work as those belonging to landed families. Due to these reasons, an area with high proportion of agricultural labourers in the population is likely to show a high participation rate in general, and of women in particular. We have, therefore, taken percentage of agricul-tural labourer in rural population as one of the variables to explain variations in FPR.

iii) The Model and Findings

The multivariate model used to explain inter-district variations in FPR is thus specified as follows (with expected signs of variables indicated).

$$FPR = a - b_1 Lm + b_2 Cp - b_3 Wf - b_4 Y + b_5 Sh + b_6 Al$$

Where :

FPR = Female Labour Force Participation Rate

a   = Constant

Lm   = Number of male workers per 100 hectares

Cp   = Percentage share of paddy in gross cropped area

Wf   = Female wage rate

Y   = Value of output per agricultural worker

Sh   = Area under holdings below 3 hectares

Al   = Percentage of agricultural labourers in rural population

$b_1 \dots b_6$ are parameters

It is likely that some of the variables included in out model are strongly correlated with each other, and, therefore, the analysis gets vitiated on account of multi-collinearity. In order to check for this problem, we examined the degree of mutual inter-relationship among independent variables on the basis of simple correlation coefficients among them. Taking coefficients with a value of 0.8 or above only as indicative of strong collinearity, we found that the only two variables which show this characteristic are percentage of area under holdings of three hectares or less and number of male workers per 100 hectares of cultivated area. We, therefore, estimated three regression equations separately one with all six variables, and two others with five variables each dropping small holding area in the first case and male worker/land area ratio in the second case. The results of the exercise are given in Table - 1.

Table - 1

Regression Coefficients : Female Labour Force Participation Rate

Equation No.	Constant term	Regression Coefficient						$\bar{R}^2$	D.F.
		Number of male worker per 100 hectares of net area	%age share of paddy in gross cropped area	Female wage rate	Value of output per agricultural worker	Area under holdings below 3 hectares	%age of agricultural labourers in rural population		
(1)	8.1887	-0.0118 (0.0321)	0.0628 (0.0561)	-0.2282 (0.9033)	-0.3779*** (0.1155)	-0.0570 (0.0797)	0.8554*** (0.2352)	0.8220	41
(2)	5.4578	-0.0281** (0.0166)	0.0462 (0.0384)	-0.0955 (0.7915)	-0.3401*** (0.0969)	—	0.9589*** (0.1486)	0.8247	42
(3)	-16.4720	—	-0.0402 (0.0499)	0.0433 (0.8067)	0.0338 (0.1006)	0.2466*** (0.0507)	1.2124*** (0.2081)	0.6835	42

Note : Figures in parantheses are the standard errors of the coefficients

*** Significant at 1 per cent level
** Significant at 5 per cent level
* Significant at 10 per cent level

The model reveals a substantially high explanatory power in all the three equations, the R^2 indicating that around 82 per cent of the variations in FPR is explained by the variables included in the first two equations and 68 per cent in the third equation. All the variables also show expected signs. In the first equation including all variables, productivity and extent of agricultural labourers show highly significant relationship with the participation rate, other variables yield insignificant coefficients, although with expected signs. Productivity per worker is found to have a negative relationship with participation of women in labour force, implying that increase in productivity and income levels leads to withdrawal of women from work.15/ The percentage of agricultural labourers in population is positively related with the participation rates, suggesting that more women from among the agricultural labourer households participate in economic activity than from among the landed households. The effects of the two variables may be combined to the extent agricultural labour households would also tend to have relatively lower incomes, but the relative lack of social inhibitions among the women of these households does also play important role in making the female participation rate high among them than among the landed households.

Once we drop the variable indicating small holdings (in equation 2) which has shown a strong correlation with male worker-land ratio, we find that the latter yields a significant coefficient, and coefficients of the agricultural labour population and productivity levels still retain a high level of significance. It seems that the availability of male labour is an important variable explaining variations in FPR, but its significance could not show up in equation (1) due to the presence of another strongly correlated variable which also was found to be insignificant. This result does not go contrary to those obtained in equation (1), but supports the 'additional worker' hypothesis of female participation rate : so long as male workers are available to take care of available work and earn a living for the family, women participate in economic activity only marginally.

Proportion of area under small holdings, is found to have significant relation with FPR, once it is used independently of male worker-net area ratio, but along with all other variables (equation 3). It, therefore, holds importance for explaining variations in participation rate. The 'omnipotent' variable agricultural labour-population ratio

retains its significance in this equation as well, but productivity, which yielded significant coefficients in the earlier two equations, fails to show a significant relationship and its coefficient also shows a positive sign, contrary to expectation. The result raises some doubt about the generally observed inverse relationship between productivity and income levels and FPR. While the earlier two equations validate this relationship, the last equation yields rather intriguing result. It is, therefore, worthwhile and interesting to examine this relationship further.

As pointed out earlier, at very low levels of incomes and wages, participation rate may rise simultaneously with income levels as more persons would need to work to raise income to a desired minimum level. Or, at least, a slight increase in incomes may not lead to any fall in overall and female participation rates. This proposition is sought to be examined by dividing the sample of 48 districts into three groups of productivity levels; districts with less than Rs.750, those with Rs.750 to Rs.1200, and those with higher than Rs.1200 as annual value of output per agricultural worker; and estimating the relationship for each of these groups. Two variables have been dropped : extent of small holdings due to its strong collinearity with male worker-land ratio; and area under paddy due to its revealed insignificance in all the equations relating to all districts. The results of the exercise are given in Table - 2.

As can be seen from the coefficients in the three equations, while percentage of agricultural labour to propulation remains highly significant at all levels of productivity, the significance of availability of male labour gets reduced as an explanatory variable as we move from high to low productivity levels, so much so that it loses significance altogether in the lowest productivity group of districts. The variable indicating income level, namely value of output per worker, retains its significance in the group of districts with the highest productivity levels, but its coefficient loses significance in the medium and low productivity group of districts. It is significant to note that female wage rate which does not show a significant relationship in the overall equation, and also in the high and medium productivity districts, is found to have highly significant negative relationship with FPR in the low productivity districts. Lower the wage rate larger is the number of women participating in economic activity, but even this high participation does not seem to produce a level of household income that would lead them to withdraw from the labour force, as seems to be the case at high productivity levels.

Table - 2

Regression Coefficients : Female Labour Force Participation Rate by
Productivity Groups

Equation No.	Constant term	Number of male worker per 100 hectares of net area	%age share of paddy in gross cropped area	Female wage rate	Value of output per agricultural worker	Area under holdings below 3 hectares	%age of agricultural labourers in rural population	$\bar{R}^2$	D.F.
		Regression Coefficient							
DISTRICTS WITH VALUE OF OUTPUT PER WORKER MORE THAN Rs.1200									
(1)	5.0362	-0.0731** (0.0305)	-	1.0328 (1.0699)	-0.2238* (0.1282)	-	0.8366*** (0.2774)	0.8109	12
DISTRICTS WITH VALUE OF OUTPUT PER WORKERS BETWEEN Rs.750 TO 1200									
(1)	20.1743	-0.0730* (0.0434)	-	1.3045 (1.9429)	-1.9498 (1.5382)	-	1.5087*** (0.3538)	0.6927	10
DISTRICTS WITH VALUE OF OUTPUT PER WORKER LESS THAN Rs.750									
(1)	14.9351	0.0030 (0.0178)	-	-4.1096*** (0.9728)	-0.5647 (0.7225)	-	0.7577*** (0.1270)	0.8964	11

Note : Figures in parantheses are the standard errors of the coefficients

*** Significant at 1 per cent level
** Significant at 5 per cent level
* Significant at 10 per cent level

To sum up, the most consistently significant relation is found to exist between share of agricultural population, and female participation rates. The relationship holds irrespective of the differences in the set of other variables used and across all productivity levels. The relationship is found to be almost one to one. The high positive influence of this variable is supported to some extent, by the proportion of small holders and moderated by the availability of male labour. Greater extent of small holdings tends to increase the proportion of workers among women and higher the number of male workers per unit of land lower is found to be the female participation rate. The latter relationship, however, is not found to hold at very low productivity levels. Productivity levels themselves have a significantly negative influence on FPR in general, but the influence is lost when the productivity levels are low, whereas female wage rates which fail to show significant coefficient in the overall situation and also in high and medium productivity groups, start showing a significant negative relationship with FPR in this group of districts with very low productivity levels.

IV. Determinants of Wages

i) Hypothesis and Variables

It has been noted earlier that there are both theoretical and empirical problems in using a simple framework of wage determination making wages a function of some indicators of demand and supply. The reported figures of workers engaged in agriculture reflect both demand and supply and thus raise the basic problem for independence of demand and supply, a necessary condition for such an explanatory framework. The concept of demand for labour in terms of 'standard' requirements, referred to earlier, measures demand only under certain normative conditions. It can, however, be used to provide a broad measure of surplus labour once compared with the measure of potential labour supply. Such a measure of surplus labour could be postulated to have a negative relationship with the wage rate. On the other hand, the universal existence of surplus labour may nullify the effects of any marginal changes in demand conditions : a rise in productivity, for example, need not lead to a rise in wages so long as surplus labour is available to work at going wage rate.

In effect, the purpose of an analysis of wage determination is not merely to find out whether demand or supply forces are important in making wage rates change. Analysis confined to this question would be rather truistic and not much meaningful. Demand and supply are influenced by a variety of factors and what is important is to identify the nature of these factors and determine the extent of their influence individually and directly on wage rates.

Beside the extent of surplus labour which would directly tend to depress wage rate, another variable that would influence wage rate from supply side is the extent of employment opportunities outside agriculture. A larger scope for work outside agriculture in the rural areas would tend to reduce supply of labour to agriculture and thereby raise the supply price of labour. On the demand side, it is plausible to argue that yield levels would influence wage rates positively. The relationship may, however, not be direct : first because of existence of surplus labour as pointed out above, and second because an increase in yield level can be brought about in a manner that may or may not raise the demand for labour. Cropping intensity and irrigation as factors in yield increase may have a positive influence or demand and, therefore, wage rates; while mechanisation, at least of certain kind, may negatively affect demand and wages of workers. Certain crops use more labour than other per unit of cultivated area, and therefore, crop pattern has its direct influence on demand for labour, and, ceteris paribus, on wages. Besides, the pattern of distribution of landholding is a factor which acts on supply, demand and wages of labour in numerous ways. A high concentration of landholdings in the hands of a few cultivators raises demand for hired labour but at the same time it also implies a large population of agricultural labours and small holders who would supply their labour on wages. The skewed distribution would also lead to an imbalance in bargaining structure16/ where a few large landholders can play the large number of wage labourers against each other to keep the wage levels low.

The scheme of variables that we have adopted for explaining inter-district variations in the wage rates follows the logic explained in above paragraphs. In the first instance we have used a rather comprehensive framework for the analysis of male wage rates using variables listed below and specified in the manner described :

1. **Surplus Labour**, measured as difference between the total available labour computed by multiplying the number of workers in agriculture by 270 days, and standardized requirements of labour in mandays, on the given area, intensity and pattern of cropping. The difference is then taken on per hectare basis.

2. **Alternative Employment Opportunities**, measured as percentage of rural workers engaged in non-agricultural activities.

3. **Yield**, measured in terms of per hectare gross output.

4. **Cropping Intensity**, measured as ratio of gross cropped area to net area in percentage terms.

5. **Irrigation**, measured as percentage of irrigated area to gross cropped area.

6. **Mechanisation**, measured in terms of a composite index computed by linearly pooling all mechanical equipments (tractors, threshers, pumpsets and tube-wells) per hectare of net area sown for each district and expressed as an index with U.P. as a whole as 100. (a) Tractors and (b) pumpsets per 1000 hectares of gross cropped area have also been used separately as independent variables.

7. **Crop Pattern**, measured as percentage share of crops requiring 100 mandays of labour per hectare or more in total cropped area.

8. **Land Distribution**, measured in terms of land concentration ratio (Gini coefficient).

For the explanation of female wage-rate variation, the variables and their specifications have been suitably modified so as to only include influences specifically relevant for female wage rates. Mechanisation and its componenets have thus been dropped as it would effect demand and wage rates in general and not specifically of women. Similar is the case with crop intensity. Surplus labour has also been dropped for the same reason. Variables relating to yield level and employment opportunities in non-agricultural sector have been retained as factors influencing demand and supply respectively of female labour. In addition, the supply of female labour has been included

directly in terms of number of female workers per 100
hectares of net area sown. Concentration ratio has been
retained as a measure of inequality determining demand,
supply and bargaining position in the labour market, as ex-
plained above. These influences may be particularly relevant
to women workers' wages, through need to supply more of their
labour if they belonged to the low income and land-less families.
For the same reason, percentage of agricultural labour in
rural population has also been included. So far as cropping
pattern is concerned it has been measured in terms of per-
centage of area under paddy cultivation to the gross cropped
areas, as it is expected to influence demand for female
labour directly.

ii)   The Models and Findings

Incorporating variables and specifications as explained
above the following form of equations (with expected signs)
have been used to explain inter-district variations in male
and female wage rates.

Model for Male Wage Determination

$$Wm = a - b_1 L + b_2 Ns + b_3 Y + b_4 I + b_5 R - b_6 T - b_7 Tt + b_8 Tp -$$
$$b_9 C + b_{10} Cp$$

Where :

Wm = Male wage rate 3130

a = Constant

L = Surplus labour

Ns = Percentage of rural workers engaged in non-
        agricultural activities

Y = Per hectare gross output

I = Intensity of cropping

R = Percentage irrigated area to gross cropped area

T = Index of mechanisation

Tt = Availability of tractors per 1000 hectares of
        gross cropped area

Tp = Availability of pumpsets per 1000 hectares of gross cropped area

C = Land concentration ratio

Cp = Percentage share of crops requiring 100 mandays per hectare or more in total cropped area

$b_1 \dots b_{10}$ are parameters

Model for Female Wage Determination

$$Wf = a - b_1 W + b_2 Ns + b_3 Y + b_4 Cp - b_5 C + b_6 L$$

Where :

Wf = Female wage rate

a = Constant

W = Number of female workers per 100 hectares of net area sown

Ns = Percentage of rural workers engaged in non-agricultural activities

Y = Per hectare gross output

Cp = Percentage share of paddy in gross cropped area

C = Land concentration ratio

L = Percentage of agricultural labourers in rural population

$b_1 \dots b_6$ are parameters

The estimated regression equations for <u>male wage rates</u> with different combinations of independent variables are presented in Table - 3. All the models incorporating the various combinations of variables show adequately high explanatory power in so far as the $\bar{R}^2$ in each case exceeds 0.8. It does not, however, vary significantly among the different equations implying that any of the sets of variables could well serve the purpose. Even the last

Table - 3
Regression Coefficients : Male Wage Determinants

Equation No.	Constant term	Surplus labour	Rural workers in non-agricultural activities (%)	Per hectare gross output	Intensity of cropping	%age of irrigated agea	Index of mechanisation	Per 1000 hectares of gross cropped area		Land concentration ratio	Crop pattern	R^2	D.F.
								Tractors	Pumpsets				
(1)	5.6397	-0.0063*** (0.0007)	0.0344*** (0.0109)	-	0.0041 (0.0071)	-0.0009 (0.0048)	-	0.0179 (0.0167)	-	-5.4101*** (1.8899)	0.0104** (0.0055)	0.8451	40
(2)	5.8105	-0.0055*** (0.0007)	0.0277*** (0.0117)	0.1445 (0.1692)	-	-0.0032 (0.0061)	-	0.0290* (0.0197)	0.0082 (0.0092)	-4.5015** (2.0500)	-	0.8326	40
(3)	5.4680	-0.0056*** (0.0007)	-	0.2998*** (0.1086)	-	-	0.0010*** (0.0004)	-	-	-3.7590** (1.9248)	-	0.8369	43
(4)	6.0793	-0.0061*** (0.0009)	0.0307*** (0.0114)	-	-	-	-	0.0203 (0.0203)	0.0041 (0.0074)	-5.3901** (2.3095)	0.0104** (0.0058)	0.8163	41
(5)	5.0697	-0.0059*** (0.0008)	-	0.4309*** (0.0923)	-	-	-	-	-	-3.2350 (2.6702)	-	0.8224	44

Note : Figures in parantheses are the standard errors of the coefficients
*** Significant at 1 per cent level
** Significant at 5 per cent level
* Significant at 10 per cent level

equation with only three variables, namely, surplus labour, per hectare yield and land concentration ratio shows as high emplanatory power, as other equations using six or seven variables. All the variables also show expected signs of their coefficients except irrigation which in any case has turned out to be insignificant.

Surplus labour turns out to be the one variable with a highly significant coefficient in each of the five equations estimated, the value of its coefficient varying marginally between -0.0055 and -0.0063. The next variable which has yielded significant coefficients in all the five equations is land concentration ratio; though in two equations it is significant at 5 per cent and in one at 10 per cent level only. Non-agricultural workers in rural labour force has a highly significant coefficient in all the three equations in which it is used. Per hectare yield was used in three equations, in two its coefficient is found highly significant, but in one not significant even at 10 per cent level. Co-efficient for cropping pattern showed significance at 5 per cent level in the two equations it was used. Mechanisation index has highly significant coefficient in the only equation it was used, with a positive sign; tractors and pump-sets, however, did not yield adequately significant coefficients in the three equations they were used, in which index of mechanisation was not included separately as a variable. Intensity of cropping and irrigation failed to yield significant relationship with the wage rates.

Thus the three factors which emerge as most significantly related with the wage rate variation are : surplus labour in agriculture; work opportunities in non-agricultural sector in rural areas and pattern of land distribution indicated by concentration ratio. Extent of surplus labour and concentration ratio are found to be inversely related with the wage rates while increase in non-agricultural employment tends to raise the wage rates. In equations (3) and (5), where non-agricultural employment is replaced by yield level in agriculture, the latter is found to be highly significantly and positively affecting the wage levels. But when yield is used along with non-agricultural employment as independent variables its significance tapers off to the level of 20 per cent. The two variables are found to be significantly correlated among themselves ($r = +0.62$). Yield, therefore, can be considered as a factor influencing the wage rates to a certain extent.

The influence of supply affecting variables like surplus labour in agriculture, and work-opportunities in non-agricultural activities which tend to reduce the surplus and, therefore, supply of labour to agriculture is, however, found to be more consistently significant. Land concentration ratio which is a supply variable to the extent it implies higher proportion of population depending on wage labour and an institutional variable to the extent it makes the bargaining position rather unfavourable for wage earners, is also found to exert strong negative influence on the wage rates. Among the demand variables, per hectare yield is found significant when considered independently of the alternative employment opportunities : cropping pattern defined in a way that relates it definitionally with demand for labour, it found significant but at 5 per cent only; crop intensity and irrigation turn out non-significant coefficients; and mechanisation index yields a significant positive coefficient, though tractors and pumpsets independently fail to show a strong relationship with wage rates. It thus looks that wage rate variations among districts are predominantly influenced by supply conditions in the market; the extent of labour surplus punctuated by employment opportunities in non-agricultural sectors and relative bargaining position determined by the pattern of land distribution explain the major part of wage rate variation. In the given supply situation, demand variables have only marginal influence, even if demand for labour increases due to whatever reason, the existence of surplus labour, non-availability of adequate employment opportunities outside agriculture and lack of bargaining power among workers, do not allow a rise in wages.

Wage Rate Equation for Females

$$Wf = 1.9147 - 0.0331W^{***} + 0.0428Ns^{***} + 0.0608Y + 0.0027Cp +$$
$$(0.0112) \quad (0.0142) \quad (0.1368) \quad (0.0082)$$

$$1.1584C - 0.0447L^{*}$$
$$(2.8652) \quad (0.0339)$$

$$\bar{R}^2 = 0.7278$$
$$D.F. = 41$$

Where : Figures in parantheses are the standard errors of the coefficients

*** Significant at 1 per cent level

* Significant at 10 per cent level

Variations in female wage rates among districts are also found to be predominantly explained by factors affecting labour supply. The two variables that turn out to be highly significant in a six-variable model with 73 per cent explanatory power as given above are : number of female workers per 100 hectares and alternative employment opportunities, specified in the same manner as in the equations for male wages. Another variable which yields a significant coefficient, even though at 10 per cent level only, is percentage of agricultural labour in rural population, a factor which also indicates supply particularly of female labour for the reasons explained earlier. Per hectare yield is not found to be significantly related with female wage rates; and even cropping pattern defined in a way to bring about demand for female labour directly (percentage of area under paddy) does not show up a significant coefficient. In this case, land concentration ratio has also failed to yield a significant relationship with wage rates. Thus it looks that the supply conditions in the labour market have come up more sharply as determinants of wage rates in the case of women workers with demand variables showing no influence whatsoever.

V. Conclusion

The present paper sought to analyse labour market behaviour in rural areas by identifying determinants of labour supply and wage rates. Labour supply was identified in terms of female labour force participation rates for the reason that supply of male labour is not found to vary significantly over space and time. Analysis of wage rates was, however, attempted both for male and female workers separately.

Supply of female labour is primarily determined by certain structural and institutional factors. Areas with larger proportions of agricultural labourers and small holdings tend to reveal a higher proportion of female population in the labour force. While the need to earn a minimum family income, and relative lack of inhibitions in taking up wage labour among the women of landless and small cultivator families account for this tendency, women still continue to be 'secondary' workers in so far as we find that availability of male labour tends to reduce labour force participation by women. So far as the purely economic variable like income is concerned, it is found to have generally a negative influence on proportion of female workers to female

population : at lower income levels participation rate among women is high, while it declines with increase in income levels. The relationship, however, does not appear to be a continuous one across all income levels : it is not found to hold at low levels of productivity and incomes, where besides the structural factors mentioned above, female wage rate has a negative influence on worker-population ratio among women. It looks that lower the wage rate for women, more of them are obliged to work to achieve their contribution to the targetted household income.

Absence of a significant negative relationship between income levels and female participation rate in the low income ranges adds some new insights into the operation of the generally observed 'U' shaped curve depicting income-female participation rate relationship, without, of course, invalidating it. While female participation rates can be expected to behave in a pattern to yield a 'U' shaped curve with rise in incomes, it would not be logical to expect such shape of the curve right from the origin of the X-axis, that is from zero or very low levels of incomes. There has to be a positive cut-off point depicting a minimum level of income from which FPR will start declining over a range of income and later show an increase again at a high levels of development and incomes. But what happens in the range below this cut-off point of income? Out analysis points out that participation rates of women are not influenced by variations in income levels below this point. It may remain constant or even rise with increases in incomes, particularly when a rise in incomes has to be brought about on the basis of larger employment at very low and declining levels of wages. The 'U' shaped curve, therefore, does not tell the whole truth, it needs to be supplemented by an analysis of FPR behaviour in the conditions where demand for additional incomes is absolutely inelastic and it cannot be brought about by marginal rise in per worker productivity and earnings.

On the question of wage determination our analysis clearly brings out the dominant influence of supply factors both for male and female wages. Extent of surplus labour and availability of alternative employment opportunities are found to account for the major part of inter-district variations in the wage rate. In low wage areas, depression in wage rates that is produced by high labour surplus and lack of employment opportunities outside agriculture is further accentuated by unfavourable bargaining

position of wage-earners resulting from high land concentration ratio and a large proportion of agricultural labour in population. In a way, these unfavourable factors exist in the entire rural sector, although to some extent, it may vary from one area to another. That is why significant variations in yield and productivity levels are not accompanied by corresponding variations in wage rates. In the districts of Uttar Pradesh included in our analysis, value of output per worker in agriculture varies between Rs.540 to Rs.2752, while male wages rates vary between Rs.1.57 and Rs.4.74 only. A higher productivity thus does not ensure a commensurate increase in wage rates,[17] due to the given supply conditions and institutional situation.

Our analysis suggests that in order to ensure an increase in wage rates with rise in productivity, demand for labour will have to rise high enough to reduce the labour surplus to the minimum. Increase in cropping intensity or use of labour intensive techniques of production may bring about such increases in demand for labour in agriculture, but they would have no impact on wage rates, even in the face of increase in yield per hectare and per worker, till they are able to raise the demand for labour almost equal to the labour supply in agriculture. This may, however, be a long drawn process; therefore, another factor which is found to have significant positive influence on wage rates in our analysis, namely employment opportunities in non-agricultural sector may prove a potent factor in reducing labour surplus and thus ensuring that wage earners have a share in the productivity gains in agriculture, in none-too-distant future. Further, our analysis also suggests that land reforms ensuring a more equitable distribution of land holdings could also lead to better correspondence between demand factors such as yield levels, and wage rates,[18] by bringing about a better balance of bargaining power between the employers and the wage earners.

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